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ABSTRACT

How successfully a student responds to the stresses of college life depends on several factors, including the time of onset, the degree of perceived threat, and the student's repertoire of coping skills. This study was conducted to determine if personal adaptability or ego-strength in college students could be predicted from knowledge of performance on scales reflecting five different problem solving dimensions of the personality (developmental autonomy, locus of control, intellectual competence, problem solving ability with a verbal component, and problem solving ability with a nonverbal component). College students (N=339) completed the Autonomy Scale of the Student Developmental Task Inventory-2, the Intellectual Efficiency Scale of the California Psychological Inventory, the Ego-Strength scale of the Minnesota Multiphasic Personality Inventory, the Internal-External Locus of Control Scale, and the Mystery Codes subtest and the Four Letter Words subtest of an experimental form of the Kaufman Adolescent and Adult Intelligence Test. The results of a step-wise regression analysis revealed that a measure of ego-strength could be predicted from knowledge of one's performance on other personality measures such as intellectual competence and locus of control. (Author/NB)

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Predicting Ego-Strength from Problem Solving Ability in College Students

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Running Head: EGO-STRENGTH

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Abstract

The purpose of this study was to determine if personal adaptability or ego-strength in college students could be predicted from knowledge of performance on scales reflecting five different problem solving dimensions of the personality (developmental autonomy, intellectual competence, locus of control, problem solving ability with a verbal component, and problem solving ability with a nonverbal component). The number of students used for data analysis was 339. A step-wise regression analysis was conducted to determine if knowledge about performance on any of the five previously mentioned scales contributed to the prediction of performance on an Ego-Strength scale. Results of this investigation indicate that a measure of ego-strength can be predicted from knowledge of one's performance on other personality measures such as intellectual competence and locus of control.

Predicting Ego-Strength from Problem Solving Ability in College Students

There seems to be little doubt that a significant relationship exists between stressful life events and a host of physiological and psychological disorders (Krantz, Grunberg, & Baur, 1985). A number of investigators have provided empirical evidence that certain life events are indeed much more stressful than others (Appels, Pool, Lubsen, & Van Der Does, 1979; Holmes & Holmes, 1978; Holmes & Rahe, 1967; Sarason, Johnson, & Siegel, 1978). One such event, pursuing a college education, has been found to be much more stressful than previously thought (Bernard & Bernard, 1982; Chickering, 1969; Mechanic, 1978; Mechanic & Greenley, 1976). Family, friends, and relatives are left behind, and a totally new environment is substituted for what used to be safe and familiar territory. Many make this transition very nicely; others do not, as indicated by the four-year 50% attrition rate of most freshmen classes (Halli, 1982; Snyder, 1987).

How successfully a student responds to the stressors of college depends on several factors: time of onset, degree of perceived threat, and an individual's repertoire of coping skills (Mehr, 1983). For many students, the need for timely and efficient crisis intervention is obvious. For others, however, the plea may be much more subtle. Heppner and his colleagues (Heppner, 1978; Heppner, Reeder, & Larson, 1983; Heppner, Neal, & Larson, 1984) have attempted to enhance this rationale by consistently and cogently arguing for preventative rather than remedial attention. In addition, they have hypothesized that psychological stress and behavioral maladjustment are consequences of ineffective problem solving techniques, an hypothesis that is supported by Kobasa (1979), Mehr (1983), and Stensrud and Stensrud (1983).

Kobasa (1979) found healthy copers to be hardy individuals. They have a

stronger commitment to self, a vigorous attitude toward the environment, a sense of meaningfulness, and an internal locus of control. Mehr (1983) believes that individuals with good coping skills are usually good problem solvers; they engage in task-oriented behavior; they appraise the situation accurately and then actively attempt to find new and useful information that can be used to resolve the problem. The assumption being that the skills and processes used to solve cognitively complex problems may also be used to reduce one's level of stress. The problem for clinicians, however, is in identifying the dimensions along which their clients attempt to generate these problem solving strategies.

Regardless of the source of the problem, Barron (1953) believes that it is possible to measure the coping skills part of the personality. He believes that there is a general factor underlying personality integration, a factor he calls ego-strength. The term was chosen to reflect his premise that a strong ego is one that is adaptable and resourceful and that performance on such a scale may serve as an indicator of a healthy personality. Referencing the work of Duckworth (1979) and Dahlstrom, Welsch, and Dahlstrom (1975), Cernovsky (1984) states very clearly that ego-strength scores can indeed be used to distinguish between healthy and maladjusted groups of individuals and that these scores can "be used to operationalize the definition of psychological health" (p. 1503). Consequently, if it becomes possible to reliable and accurately estimate an individual's approach to problem solving ability using traditional measures of personality assessment, then it may also become possible to translate this approach to social or environmental approaches to functioning as well.

Despite the plethora of information on college students, the types of symptomatology, and the potential utility of cognitive approaches, few if any

investigators have attempted to predict a measure of coping skills from a purely problem solving model. The purpose of this study was to determine if a measure of coping ability or ego-strength in college students could be predicted from knowledge or performance on scales reflecting five different problem solving dimensions of the personality. The five independent variable scales were selected to represent developmental, psychosocial, and cognitive aspects of personality development. Only scales intended for, normed on, or otherwise documented for use with college students were selected.

Method

Participants

A total of 348 graduate and undergraduate students at a large southeastern university were administered four published scales assessing different aspects of personality and development and two newly developed scales of verbal and nonverbal problem solving ability. Of the 348 questionnaires completed, 9 had incomplete or random response patterns; thus, the number of participants used for complete data analysis was 339.

The respondents ranged from 17-45 years of age (M = 21.5 years; SD = 3.4 years). The sample was fairly evenly divided according to gender (59% female, 41% male). The majority, or 92%, reported to be Caucasian, 6% were Black, 1% Hispanic, and 1% Other. A total of 14% were freshmen, 38% were sophomores, 32% were juniors, 10% were seniors, 2% were graduate, and 4% were some other class standing (e.g., weekend college, continuing education). Information obtained from students on college division was as follows: Arts and Sciences (13%), Commerce and Business Administration (12%), Communications (7%), Education (52%), Engineering (5%), Graduate College (1%), Home Economics (3%), Nursing (2%), Social Work (1%), and Other (4%).

Students were recruited from introductory psychology, educational

psychology, math, and statistics classes; extra credit was used as an incentive to encourage participation. Because of the preponderance of female students and education majors in these classes, all recruits were also asked to bring a member of the opposite sex from a major other than education. Students were asked to attend one of five two-hour sessions for administration of the scales. The sessions were offered during a two-week time period.

Instrumentation

Respondents were provided two booklets and a computer scan sheet on which to respond. One booklet contained 197 questions or statements composed of the following four scales: (a) the Autonomy Scale of the Student Developmental Task Inventory--2 (Winston, Miller, & Prince, 1979), (b) the Intellectual Efficiency Scale of the California Psychological Inventory (Gough, 1975), (c) the Ego-Strength scale of the Minnesota Multiphasic Personality Inventory (Barron, 1953), and (d) the Internal-External Locus of Control Scale (Rotter, 1966). The other booklet contained the Mystery Codes subtest and the Four Letter Words subtest of an experimental form of the Kaufman Adolescent and Adult Intelligence Test (Kaufman & Kaufman, 1988). All scales were administered by the same examiners in counterbalanced order to preclude an order effect. Permission to use these scales was obtained from the publisher of each instrument.

The six scales were chosen for their relevance to the study and their specific relevance to the college student population. The Autonomy scale of the Student Developmental Task Inventory--2 was designed to measure the extent to which college students perceive themselves as self-sufficient, self-confident, and cognizant of their responsibilities to others (Winston et al., 1979). The Manual reports a coefficient alpha of .78 for the Autonomy scale, with a test-retest coefficient after two weeks of .91 (N = 38; Winston,

Miller, Hackney, Hodges, Polkosnik, Robinson, & Russo, 1981). Stonewater, Daniels, and Heischmidt (1986) found a coefficient alpha of .68, with a test-retest coefficient after two weeks of .72 (N = 19).

Because a number of investigators have attempted to link intellectual competence with general/interpersonal adaptability (Heppner et al., 1984; Stensrud et al., 1983; Mehr, 1983), the Intellectual Efficiency scale of the California Psychological Inventory (CPI; Gough, 1975) was used. The Intellectual Efficiency scale consists of 52 True/False items, which combine to form a "subtle measure of intelligence," and is designed to measure the ease and efficiency with which an individual is able to apply one's intellectual resources (Gough, 1968, p. 17). The popularity of the CPI has increased substantially over the years, placing it second only to the MMPI as a clinical and research tool (Baucom, 1986). The CPI has college norms and is intended for use with normal populations. Gough (1975) reports median test-retest values of the Intellectual Efficiency scale to be .75 (1 year; N = 226) for a high-school sample, and .80 (7 days; N = 200) for an incarcerated sample. In addition, Gough (cited in Megargee, 1972) found the Intellectual Efficiency scale correlated about .50 with high-school, college, and graduate grade point averages; .58 with the Terman Concept Mastery Test; and .44 with the Miller Analogies Test.

The Ego-Strength scale (Barron, 1953) is only one of many special scales developed from the parent Minnesota Multiphasic Personality Inventory (MMPI; Hathaway & McKinley, 1970). The MMPI is considered to be the primary clinical and research instrument of psychopathology. Its use with the general and special populations has been well documented (Dahlstrom, Welsch, & Dahlstrom, 1972, 1975). The original purpose of the Ego-Strength scale was to predict the response of neurotic clients to psychotherapy. Research since its

genesis in 1953 has supported a somewhat broader interpretation. Barron (1953) reported that the scale can be used to effectively assess one's adaptability and personal resourcefulness, personality integration, or ego-strength. Barron chose the term ego-strength because of his belief that an impaired personality cannot pull together the constructive forces necessary to control a disturbed ego. The scale consists of 68 True/False items from the MMPI. Very little current empirically verifiable information is available on this scale. Barron (1953) reported a correlation of .44 with the Wechsler-Bellvue, .36 with the Primary Mental Abilities Test, and .47 with the Intellectual Efficiency scale of the CPI (sample sizes unavailable). Artwohl (1979; $\underline{N}$ = 43) reported a correlation of -.41 with Rotter's Internal-External Locus of Control Scale.

Rotter's Internal-External Locus of Control Scale was used intact. The instrument has its roots in social learning theory and is designed to measure the degree to which people believe "rewards are contingent upon their own behavior, or due to some other factor such as luck or chance" (Rotter, 1966, p. 1). The inventory consists of 29 paired statements, one internal and one external. The inventory yields one global raw score for each respondent. Scores range from 0 (most internal) to 23 (most external); six pairs of items are included as buffers to mask the intent of the scale. Test-retest reliability over two months ranged from .48 to .84 (Median = .72; Hersch & Scheibe, 1967). Internal consistency on several different samples ranged from .65 to .76 (Median = .72; Rotter, 1966). The literature is divided on the number of common factors in the scale; however, most researchers indicated one main factor with some suggesting a second, smaller one (Lachman, 1986; Mirels, 1970; Rotter, 1966).

Mystery Codes and Four Letter Words are two newly developed subtests of a

larger battery, the Kaufman Adolescent and Adult Intelligence Test (Kaufman & Kaufman, 1988). Both subtests used in this analysis were taken from the national item tryout forms. Coefficient alphas were as follows: Mystery Codes, .85 (Form C; N = 53), and Four Letter Words, .82 (Form B; N = 215). The origin of these scales is the work of Luria (1966) and his belief that a third factor, planning ability, constitutes a key component of adult mental processing ability. In Mystery Codes the examinee is provided with a series of four or five pictures, each with its own code beside it. The examinee must first find commonalities in each of the pictures to decipher the code and then identify the appropriate code for a new item, the test item. The procedure for Four Letter Words is much the same; the examinee must identify a secret word from clues found in other words. Harrison and Kaufman (1986) indicated that examinees who are successful at solving these problems will likely be those who can successfully generate enough appropriate strategies to solve any type of problem when presented with new and unfamiliar stimuli.

Procedure

Two different statistical techniques were used to analyze the data. First, Pearson correlation coefficients were computed using SAS Statistical Software (SAS; Freund & Littell, 1986), and a complete intercorrelation matrix was constructed for all possible combinations of measures. A test of non-zero correlation was conducted for each comparison; Bonferroni's correction techniques was used to maintain an experiment-wise error rate at the .05 level across all 15 comparisons (Dunn, 1961). With this adjustment the hypothesis-wise error rate for each correlation was estimated to be .003, and, thus, a critical value of $t(339) = 3.320$ (alpha = .001) was identified as the most appropriate and sensitive measure of significance (Glass & Hopkins, 1984).

Second, a step-wise regression analysis was performed using the same

software (SAS; Freund & Littell, 1986) to determine the degree to which raw score performance on the MMPI's Ego-Strength scale could be predicted from raw score performance on five independent variable scales: developmental autonomy (Autonomy scale of the Student Developmental Task Inventory--2), intellectual competence (Intellectual Efficiency scale of the California Psychological Inventory), locus of control (Rotter's Internal-External Locus of Control Scale), nonverbal problem solving ability (Mystery Codes of the Kaufman Adolescent and Adult Intelligence Test), and verbal problem solving ability (Four Letter Words of the Kaufman Adolescent and Adult Intelligence Test). All assumptions were met, residuals analyzed, and no evidence of multicollinearity was found. Subtest mean and standard deviation values are listed in Table 1.

Insert Table 1 about here

Results and Discussion

Because of the nature of the questionnaire and the belief that each scale measures some aspect of the human personality, it was important to see how performance on one scale covaried with performance on each of the other scales. Consequently, Pearson correlations were computed for all possible combinations of the six variable scales. A complete intercorrelation matrix is listed in Table 2.

Insert Table 2 about here

Despite the high number of significant relationships among the variables, none were found to be collinear. The strongest correlation was between

Intellectual Efficiency and Ego-Strength (.61). The correlations between Autonomy and Ego-Strength (.28) and between Locus of Control and Ego-Strength (-.29) were low but significant. The negative correlation between Locus of Control and Ego-Strength seems to indicate that individuals who are more resilient and adaptable have a lower, more internal locus of control, a finding that is supported by Kobasa's hypothesis (1979, p. 3) that healthy individuals are those who "have a greater sense of control over what occurs in their lives" and hence are individuals with an internal locus of control. The correlations between Mystery Codes and Ego-Strength and between Four Letter Words and Ego-Strength were not significant.

Correlations among the independent scales revealed moderate but significant relationships between Intellectual Efficiency and autonomy (.42) and between Intellectual Efficiency and Locus of Control (-.32). The correlations between Autonomy and Locus of Control (-.14), Mystery Codes (.18), and Four Letter Words (.15) were weak but significant, as was the correlation between Intellectual Efficiency and Mystery Codes (.18). The relationship between the two verbal and nonverbal problem solving tasks, Mystery Codes and Four Letter Words, was low but significant (.24).

To determine the extent to which knowledge about performance on any of the five variable scales actually contributes to the prediction of Ego-Strength raw score, a step-wise regression analysis was conducted. Although the contributions of all five independent variables were examined, only scores on the Intellectual Efficiency and Locus of Control scales were found to be significant predictors of Ego-Strength raw score, as seen in Table 3. The squared multiple correlation obtained when Intellectual Efficiency and Locus of Control were used as predictors (.39, $p = .018$) was compared to the squared correlation obtained when Intellectual Efficiency was used as the sole

predictor (.38, p = .001). Although both analyses were found to be statistically significant ($p \leq .025$), it is likely that the small increase from one to two predictors is more a statistical artifact due to sample size than it is of practical significance. Thus, eta^2 = 39%, leaving 61% of the variability unaccounted for, or accounted for by variables not identified in this study.

Insert Table 3 about here

Results of this investigation found the single best predictor of ego-strength to be a measure of intellectual competence. The ability to predict ego-strength can be further enhanced through information about locus of control. It is likely then that whatever personality correlate is related to examinees doing reasonable well on measures of intellectual aptitude is also related to doing well on tasks pertaining to a general sense of well-being. The relationship is logical. Those who believe that behavioral rewards are determined by one's own ability and not by luck or chance may have much in common with those who feel comfortable applying their intellectual abilities in well chosen tasks.

Interestingly, knowledge of performance on the Autonomy scale did not add to the prediction of Ego-Strength raw score. This occurred despite the moderately strong correlation between Autonomy and the model's best predictor, Intellectual Efficiency (.42), and the significant correlations between Autonomy and all of the other variables in the study (Median correlation = .16). Thus, a measure of intellectual competence was able to contribute something that a developmental scale such as Autonomy could not. A number of explanations are possible: (a) that there exists a developmental component to

all problem solving tasks that is unrelated to ego-strength; (b) that integration of the personality occurs long before college age, and thus the ego is largely unaffected by the presence or absence of various developmental tasks once one enters college; and (c) that once one gets to college, developmental status plays a much more limited role in the application of intellectual ability.

Somewhat disappointing was the finding that those tasks specifically designed to assess verbal and nonverbal problem solving, Mystery Codes and Four Letter Words, did not contribute to the predictive ability of Ego-Strength raw score. It must be kept in mind, however, that these scales were administered in their tryout form and not in the final or standardized version. Thus, these two subtests are only currently considered to be problem solving tasks. Further research will be needed to substantiate this role. Conversely, it is also possible that future research will corroborate Kaufman & Kaufman's (1988) theoretical hypothesis that these tasks are indeed problem solving tasks and, in doing so, refute Mehr's hypothesis, that a significant relationship exists between coping ability and effective problem solving ability.

While the findings of this study did not support the relationship between all problem solving dimensions of personality and ego-strength, evidence was found to support the original research hypothesis, that ego-strength can indeed be predicted from knowledge of one's performance on tasks designed to measure problem solving dimensions of personality, which are, in this case, intellectual competence and locus of control. Two other corollaries also seem reasonable: (a) whatever factor underlies one's ability to be intellectually assertive, competent, and resourceful appears to be related to a relatively strong ego; and (b) expectancy for success is related to both intellectual

competence and strength of the personality. Individuals with relatively weak egos simply do not perceive themselves as having the ability to control their own destiny (Artwohl, 1979; Burnes, Brown, & Keating, 1971; Hale & Cochran, 1986).

There are a number of limitations to this study. Most important, the sample was not random and, thus, cannot be assumed to represent all college students nationwide, or even from all majors. For the results to generalize to all students, one would have to control for such variables as age, race, sex, residence, socio-economic status, and geographic region. Second, there is currently very little validity information on the role of Mystery Codes and Four Letter Words as measures of nonverbal and verbal measures of problem solving ability. There is, however, a theoretical basis in the work of Kaufman and Kaufman (1983, 1988), Luria (1966), and Thorndike, Hagen, and Sattler (1986), and, conceptually, these scales appear to meet all of the necessary requirements. More information is needed on the validity of the Autonomy scale as a true measure of developmental autonomy. Its relationship with all other measures appeared to be significant; however, until this particular construct can be measured well enough to empirically define the construct of autonomy, its contributions to shared variability will go unknown. Finally, this battery attempts to predict a measure of ego-strength using fairly traditional forced-choice, paper-and-pencil items. It would be interesting to devise a method by which ego-strength could be explained using much more qualitative or affectively based items.

In regard to the utility of these findings for predicting and responding to the stressful disorders of college students, it seems clear that individuals vary as to their ability to effectively respond to everyday stressors. Individuals vary as to their expectancy for success, their level

of autonomy, and their degree of intellectual competence. All are important variables to consider when working with students who, for whatever reason, are not coping well. From evidence gathered here it appears that a person's measure of ego-strength can in fact be predicted from measures of intellectual competence and locus of control. It must be kept in mind, however, that a measure of intellectual competence or, in this case, performance on the Intellectual Efficiency scale of the CPI is the single best predictor of ego-strength.

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Table 1

Group Mean and Standard Deviation Values

Variable	Mean	SD
Autonomy	28.23	5.81
Intellectual Efficiency	34.48	5.38
Ego-Strength	41.85	6.46
Locus of Control	10.58	3.68
Mystery Codes	16.09	6.36
Four Letter Words	12.38	4.25

N = 339.

Table 2

Intercorrelation Matrix of Autonomy (Aut), Intellectual Efficiency (IE), Ego-Strength (E-S), Locus of Control (LOC), Mystery Codes (Codes), and Four Letter Words (Words)

	Aut	IE	E-S	LOC	Codes
IE	.42*	---			
E-S	.29*	.61*	---		
LOC	-.14**	-.32*	-.29*	---	
Codes	.18*	.18*	.09	-.08	---
Words	.15*	.09	.06	-.07	.24*

N = 339.

*$p \leq .01$.

**$p \leq .05$.

Table 3

Regression Analyses Comparing a Measure of Intellectual Efficiency (IE) as the Sole Predictor with Measures of Intellectual Efficiency and Locus of Control (IE and LOC) as Joint Predictors

Predictors	R	R^2	F	p-value
IE	.61	.38		.0001
IE and LOC	.62	.39	5.66	.0179

N = 339.